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UNITED STATES ARMY

HEALTH CARE STUDIES AND

CLINICAL INVESTIGATION ACTIVITY

A COMPARISON OF DENTAL FITNESS CLASSIFICATION USING DIFFERENT CLASS 3 CRITERIA: A REPORT OF CONSULTATION

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The study was directed by the Office of the Chief of the Army Dental Corps to estimate the extent to which a recent DOD Instruction providing criteria for placing a soldier in Class 3 proportion Armywide.

Examinations were performed on 585 Army Reserve Component soldiers during their active duty training at Fort Pickett, Virginia from June through September, 1991. Of the 585 soldiers, 338 (57.8%) were in Class 3 using the current DOD criteria while 272 (46.5%) were in Class 3 using the previous criteria. Of 585 paired examinations there was agreement between the two systems in 531 (90.8%) examinations. Over 96 percent of the disagreement represented patients put in Class 2 under the old system who were put in Class two under the new system. In the aggregate, there were 19.3 persent more soldiers put into Class 3 under the new system. The major source of this difference was partically erupted or pericoronally involved third molars. The increase in the Class 3 proportion is an artifact

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of the current DOD criteria and should be considered when pre and post DOD Instruction dental fitness classification data are compared for a population.

AD-A255417 Words/Phrases(4 words max) that match Thesaurus Entries

TEXT	THESAURUS
ACTIVE DUTY	Active Duty
AGREEMENT	Agreements
ARMY	Army
ARTIFACT	Artifacts
ESTIMATE	Estimates
INSTRUCTION	Instructions
PATIENTS	Patients
REQUIREMENTS	Requirements
SOLDIER	Army Personnel
SOLDIERS	Army Personnel
TRAINING	Training
VIRGINIA	Virginia

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@27@ The study was directed by the Office of the Chief of the Army Dental Corps to estimate the extent to which a recent DOD Instruction providing criteria for placing a soldier in Class 3 proportion Armywide. Examinations were performed on 585 Army Reserve Component soldiers during their active duty training at Fort Pickett, Virginia from June through September, 1991. Of the 585 soldiers, 338 (57.8%) were in Class 3 using the current DOD criteria while 272 (46.5%) were in Class 3 using the previous criteria. Of 585 paired examinations there was agreement between the two systems in 531 (90.8%) examinations. Over 96 percent of the disagreement represented patients put in Class 2 under the old system who were put in Class two under the new system. In the aggregate, there were 19.3 persent more soldiers put into Class 3 under the new system. The major source of this difference was partically erupted or pericoronally involved third molars. The increase in the Class 3 proportion is an artifact Dental Fitness Class 3; Dental Treatment Needs; Fort Pickett; Virginia; Army Reserve Dental Requirements.
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EXECUTIVE SUMMARY

The study was directed by the Office of the Chief of the Army Dental Corps to estimate the extent to which a recent DoD Instruction providing criteria for placing a soldier in Class 3 would change the Class 3 proportion Armywide.

Examinations were performed on 585 Army Reserve Component soldiers during their two week Annual Training at Fort Pickett, Virginia from June through September, 1991. Of the 573 soldiers with complete records, 338 (57.8%) were in Class 3 using the current DoD criteria while 272 (46.5%) were in Class 3 using the previous criteria. Of 585 paired examinations there was agreement between the two systems in 531 (90.8%) examinations. Over 96 percent of the disagreement represented patients put in Class 2 under the old system who were put in Class 3 under the new system.

In the aggregate, there were 19.3 percent more soldiers put into Class 3 under the new system. The major source of this difference was partially erupted or pericoronally involved third molars. The increase in the Class 3 proportion is an artifact of the current DoD criteria and should be considered when pre and post DoD Instruction dental fitness classification data are compared for a population.

ACKNOWLEDGMENT

This study could not have been performed without the efforts of the staff of the Fort Lee Dental Activity. The Commander, COL Joseph Perry, put his staff at our disposal and personally supervised the data collection effort. COL John Kuhn calibrated the examiners to his standards, served as OIC at the Fort Pickett Dental Clinic. SSG Richard Orona the NCOIC of the Fort Pickett Dental Clinic, was the liaison with the examined units and supervised the data entry process. The examiners were COL Joseph L. Perry, COL John B. Kuhn, COL William F. Hunter, CPT Jeffrey D. Cohen, and CPT Servando Ramos, Jr. The dental assistants were SPC Leigh D. Speicher, SPC Gilann D. Holliday, SPC Rochelle J. Hargrove, and PFC Antonio M. Hales. Data entry was completed by SPC Leigh D. Speicher and SPC Marthie E. Gilbreath.

Background

In an effort to reduce the number of personnel likely to have dental emergencies in the theater of operations, the military services developed systems to identify individuals with potential emergencies. The result was three related, but incompatible dental fitness classification systems that worked well for the services, but did not allow for interservice comparisons to be made.

In order to standardize the reporting of service members dental categories between the services, DoD directed the services to categorize their the personnel as: Class 1 - no treatment required; Class 2 - existing condition is unlikely to result in a dental emergency within the next 12 months; Class 3 - existing condition is likely to result in a dental emergency within the next 12 months; and Class 4 - dental examination required.[1]

The Army implemented the DoD directive in AR 40-3[2] on 15 February, 1985. On 8 September 1987, the Navy clarified these criteria.[3] On 1 January 1988, the Air Force implemented its own clarifications to the DoD criteria.[4] The Army made slight changes to the classification criteria on 25 April 1989.[5] The result was three systems that were similar, but not identical. In a further attempt to resolve the inconsistencies between the services' interpretations of the classification criteria the DoD issued further guidance to the services on 1 March, 1991.[6]

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[1]Department of Defense Instruction 6410.1, Standardization of Dental Classification and of Specifications for Conducting Dental Examinations, 29 Apr 1985.

[2]AR 40-3, Medical, Dental, and Veterinary Care, 15 Feb 85.

[3]Naval Medical Command Regulation 6600, Dental Classification of Individuals, 8 Sep 87.

[4]United States Air Force Dental Classifications, 1 Jan 88.

[5]AR 40-35, Preventive Dentistry, 25 April 1989. The definition Class 4 was broadened to include soldiers without a confirmed duplicate panograph on file at the Central Storage Facility. In addition, soldiers were not placed into Class 4 until they missed a second annual examination.

[6]Department of Defense Instruction 6410.1, Standardization of Classifications, 1 Mar 91.

Purpose

At the request of the Office of the Chief of the Army Dental Corps, the Dental Studies Division of the Health Care Studies and Clinical Investigation Division planned and executed a study to estimate the extent to which the recent DoD Instruction would change the Class 3 proportion Armywide.

Methods

Overview

The study was designed to take advantage of the large number of Reserve Component (RC) soldiers presenting for panographic radiographs at Fort Pickett, Virginia between 7 and 17 June, 1991. Reserve Component soldiers were selected because of the high proportion of soldiers in Class 3 found in a 1985 nationwide study[7] and later confirmed by predeployment examinations for Operations Desert Shield/Storm. Patients were RC soldiers reporting to the dental clinic at Fort Pickett for a panographic radiograph between 7 June and 17 June 1991. It was hoped that a large enough proportion of the soldiers reporting to the clinic would be in Class 3 for the required sample size to be achieved.

Old Classification System.

Examiners were asked to use the same decision process for placing patients in Class 3 that they used before the implementation of the DoD Instruction. No attempt was made to calibrate examiners under the old sy'stem since the existing dental fitness classification database comprises data from thousands of dentists each with his own interpret
ation of what is likely to cause a dental emergency within one year.

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[7]Dental Needs of Reserve Component Soldiers, 1985. Unpublished data. US Army Health Care Studies and Clinical Investigation Activity, Fort Sam Houston, TX 78234-6060.

New Classification System.

The most experienced general dentist among the examiners was selected as the standard against which the others were calibrated. He examined ten patients while the other examiners observed. After a discussion period 20 patents were examined by all examiners. The results were analyzed and discussed.

Examiners

Examiners were three general dentists, one prosthodontist, and one public health dentist with collective clinical experience ranging from five to 22 years. Their rank and the number of examinations performed are shown in Table 1.

A calibration session was held on 9-10 June 1991 at Fort Lee, Virginia. All examiners were given a presentation on the purpose and methods of the study and the letter of instruction (Appendix A). Each criterion listed in the DoD Instruction was discussed before patients were examined.

Examination

The examination was performed using a mirror and explorer on a standard dental chair with an attached light, but without radiographs. Patients were examined first without, then with the new DoD criteria. When a tooth that placed the patient in Class 3 was identified the examiner told the recorder the tooth number, the specific criterion that applied, and whether that tooth would place the patient in Class 3 under the old system. Soft tissue lesions placing the patient in Class 3 were recorded in a similar manner.

Data Entry and Database Creation

Data Entry.

Clinical data were recorded by clerical personnel either on a paper form or a laptop computer using a data screening program. Entries were based on calls made by the examining dentist. Administrative data were obtained by interview and were entered either by administrative personnel at the time of initial processing or chairside before the examination.

Database Creation.

Data from the laptop computers were consolidated at the U.S. Army Health Care Systems Support Activity. Completed data collection forms were sent to HCSCIA and keyed to disk by HCSCIA personnel. The data were analyzed using both mainframe and PC versions of the Statistical Analysis System.

Results

Patient Demographics

Of the 585 patients examined 577 (98.6%) had complete records. Four hundred thirty-six (75.6%) of the soldiers were from combat arms units,[8] 8 (1.4%) were from combat support units,[9] and 133 (23.1%) were from combat service support units (Table 2).[10] The sex distribution was 90.2% male and 9.8% female. The age of the sample ranged from 18 to 59 years with a mean and standard deviation of 29.7 and 7.68 years, respectively, and a median of 29 years. Table 3 shows the distribution by age band. Table 4 shows the pay grade distribution of the sample.

Dental Fitness Classification under the Old System

Table 5 shows that mandibular right molars were 30.8% of all Class 3 teeth with 11.5% due to tooth number 32. Since the sole criterion for a tooth's being categorized as Class 3 was whether it was likely to require emergency treatment within a year the examiners were not asked to indicate the specific clinical finding that placed the tooth in Class 3.

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[8]Those units or organizations whose primary mission is destruction of enemy forces and/or installations, such as infantry, air defense artillery, field artillery, armor, aviation, special forces, and combat engineers.

[9]Combat support is operational assistance (including direct combat involvement) furnished combat elements by other designated units such as signal, military police, chemical, and military intelligence.

[10]Combat service support is the assistance provided to operating forces primarily in the fields of administrative services, chaplain services, civil affairs, finance, legal services, health services, supply, management, maintenance, transportation, construction engineers, acquisitions, engineering functions, food services, graves registration, laundry, dry cleaning, bath, property disposal, and other logistic services.

Dental Fitness Classification under the New System

Table 6 shows that mandibular right molars were 31.0% of all Class 3 teeth. Table 7 shows the distribution of criteria (diagnoses) placing patients in Class 3. The majority (55.5%) of conversions was due to caries, with unerupted teeth (16.5%),[11] and periocoronitis (14.2%) contributing substantially.

Comparison between Old and New Classification Systems

Table 8 compares the dental fitness classifications under both systems. Under the new system 338 (58.7%) were in Class 3 while only 272 (47.5%) were in Class 3 under the old system. The new system has a Class 3 proportion that is 11.2 percentage points (19.3%) higher than that of the new system.

Table 9 compares the fitness classification under both systems. The entries on principal diagonal represent agreement under both systems, while all other entries represent disagreement. Of the 585 paired examinations, there were 531 agreements, or 90.8 percent agreement. The matrix is asymmetric, with 52 of 54 (96.3%) disagreements located above the principal diagonal. No explanation can be offered for the two cases placed in Class 2 under the old system and Class 1 under the new system. Of the 54 disagreements, 50 (92.6%) were Class 2 under the old system and Class 3 under the new system.

Teeth Converting to Class 3.

Table 10 shows the teeth that are Class 3 under the new system that were not in Class 3 under the old system. Third molars were responsible for 50.8% of the conversions with mandibular third molars responsible for the majority (43.1%) of the those conversions. Table 11 shows the diagnoses of the teeth responsible for the conversion. Unerupted teeth[12] (40.9%) and pericoronitis (22.7%), and caries (12.1%) were responsible for 75.7% of the conversions.

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[11]Since radiographs were not used only partially unerupted teeth could be seen.

[12]Since radiographs were not used only partially unerupted teeth could be seen.

Discussion

Comparison of Class 3 Proportions under Both Systems

The 11.2 percentage point, or 19.3% difference between old and new classification systems is an artifact of the classification criteria of the new system. This difference should be taken into account when comparisons of dental fitness classification are made between data collected before and after the implementation of the new system.

Sensitivity Analysis

Interrater Reliability.

The kappa statistic[13] was used to measure the level of agreement between dentists on the 47 (8%) records reviewed by more than one dentist. It is "interpretable as a measure of agreement beyond that solely due to chance."[14] In general, a weighted kappa of less than 40 percent signifies poor agreement between 40 and 75 percent good agreement, and over 75 percent excellent agreement.[15]

Table 12 shows the kappa statistics for the agreement under the old system between COL Kuhn (the standard), against whom the examiners were calibrated and the examiners. The level of agreement is moderately strong to strong and all kappas are statistically different from zero.

Table 13 shows the kappa statistics for the agreement under the new system between the standard and the other examiners. The level of agreement is weak for one examiner, and moderately strong to strong for the others. The level of agreement is moderately strong to strong and all kappas are statistically different from zero.

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[13]Kappa was calculated using a program written in SAS IML® by Dr. Robert Terry, Department of Psychology, Duke University.

[14]R.L. Hunt. (1986). Percent Agreement, Pearson's Correlation, and Kappa as Measures of Inter-examiner Reliability. J Dent Res, 65(2):128-130.

[15]J.L. Fleiss. Statistical Methods for Rates and Proportions. John Wiley & Sons, 2nd edition, New York, 1981, p. 223.

Conclusion

Applying the DoD classification criteria resulted in a 19.3 percent increase in the Class 3 proportion. Most of this increase was due to the presence of partially erupted or pericoronally involved third molars. The fact that applying the DoD classification criteria increases the Class 3 should be taken into account when the dental fitness of a population categorized earlier is compared to that of a population categorized under the current DoD criteria.

REFERENCES

1. Department of Defense Instruction 6410.1, Standardization of Dental Classification and of Specifications for Conducting Dental Examinations, 29 Apr 1985.

2. AR 40-3, Medical, Dental, and Veterinary Care, 15 Feb 85.

3. Naval Medical Command Regulation 6600, Dental Classification of Individuals, 8 Sep 87.

4. United States Air Force Dental Classifications, 1 Jan 88.

5. AR 40-35, Preventive Dentistry, 25 April 1989. The definition Class 4 was broadened to include soldiers without a confirmed duplicate panograph on file at the Central Storage Facility. In addition, soldiers were not placed into Class 4 until they missed a second annual examination.

6. Department of Defense Instruction 6410.1, Standardization of Classifications, 1 Mar 91.

7. Dental Needs of Reserve Component Soldiers, 1985. Unpublished data. US Army Health Care Studies and Clinical Investigation Activity, Fort Sam Houston, TX 78234-6060.

8. R.L. Hunt. (1986). Percent Agreement, Pearson's Correlation, and Kappa as Measures of Inter-examiner Reliability. J Dent Res, 65(2):128-130.

9. J.L. Fleiss. Statistical Methods for Rates and Proportions. John Wiley & Sons, 2nd edition, New York, 1981, p. 223.

TABLES

Table 1

Number of Examinations Performed by Examiner

Examiner	N	Percent
Standard	192	32.8
Examiner 1	152	26.0
Examiner 2	35	6.0
Examiner 3	29	5.0
Examiner 4	177	30.3

Table 2

Number of Patients by Type of Unit (N=577)

Type of Unit	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Combat Arms	436	75.6	436	75.6
Combat Support	8	1.4	444	76.9
Combat Service Support	133	23.1	577	100.0

Table 3

Distribution of Sample by Age Band
(N=578)

Age Band	Frequency	Cumulative Percent	Cumulative Percent
Under 20	23	4.0	4.0
20 - 24	144	24.9	28.9
25 - 29	153	26.5	55.4
30 - 34	131	22.7	78.0
35 - 39	53	9.2	87.2
40 - 44	44	7.6	98.1
Over 44	11	1.9	100.0

Table 4

Distribution of Sample
by Pay Grade (N=584)

Pay Grade	Frequency	Percent
E1	27	4.6
E2	48	8.2
E3	81	13.9
E4	178	30.5
E5	122	20.9
E6	51	8.7
E7	18	3.1
E8	8	1.4
E9	1	0.2
W3	2	0.3
W4	2	0.3
O1	12	2.1
O2	16	2.7
O3	8	1.4
O4	7	1.2
O5	3	0.5

Table 5

Class 3 Teeth Old Criteria
(N=270)

Tooth Number	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	6	2.2	6	2.2
2	11	4.1	17	6.3
3	8	3.0	25	9.3
4	5	1.9	30	11.1
5	8	3.0	38	14.1
6	1	0.4	39	14.4
7	2	0.7	41	15.2
8	4	1.5	45	16.7
9	5	1.9	50	18.5
10	3	1.1	53	19.6
11	3	1.1	56	20.7
12	4	1.5	60	22.2
13	10	3.7	70	25.9
14	11	4.1	81	30.0
15	22	8.1	103	38.1
16	3	1.1	106	39.3
17	9	3.3	115	42.6
18	14	5.2	129	47.8
19	21	7.8	150	55.6
20	13	4.8	163	60.4
21	3	1.1	166	61.5
22	1	0.4	167	61.9
23	1	0.4	168	62.2
24	2	0.7	170	63.0
25	6	2.2	176	65.2
26	2	0.7	178	65.9
27	1	0.4	179	66.3
28	2	0.7	181	67.0
29	6	2.2	187	69.3
30	21	7.8	208	77.0
31	31	11.5	239	88.5
32	31	11.5	270	100.0

Table 6

Class 3 Teeth New DoD Criteria
(N=336)

Tooth Number	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	2.1	7	2.1
2	10	3.0	17	5.1
3	7	2.1	24	7.1
4	4	1.2	28	8.3
5	4	1.2	32	9.5
6	4	1.2	36	10.7
7	4	1.2	40	11.9
8	7	2.1	47	14.0
9	4	1.2	51	15.2
10	1	0.3	52	15.5
11	3	0.9	55	16.4
12	3	0.9	58	17.3
13	5	1.5	63	18.7
14	16	4.8	79	23.5
15	24	7.1	103	30.7
16	6	1.8	109	32.4
17	22	6.5	131	39.0
18	12	3.6	143	42.6
19	18	5.4	161	47.9
20	11	3.3	172	51.2
21	3	0.9	175	52.1
22	3	0.9	178	53.0
23	4	1.2	182	54.2
24	12	3.6	194	57.7
25	13	3.9	207	61.6
26	12	3.6	219	65.2
27	4	1.2	223	66.4
28	2	0.6	225	67.0
29	7	2.1	232	69.0
30	19	5.7	251	74.7
31	31	9.2	282	83.9
32	54	16.1	336	100.0

Table 7

Reasons for Class 3 Under
New DoD Criteria
(N=339)

Reasons	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Caries	188	55.5	188	55.5
Temp Restoration	12	3.5	200	59.0
Pericoronitis	48	14.2	248	73.2
Advanced Perio	25	7.4	273	80.5
Progressive Perio	1	0.3	274	80.8
Edentulous Areas	7	2.1	281	82.9
Unerupted Teeth	56	16.5	337	99.4
Pulp Pathology	1	0.3	338	99.7
Soft Tissue Lesion	1	0.3	339	100.0

Table 8

Comparison of Dental Fitness Class under Old
and New DoD Criteria

Classification	Old System		New System	
	Number	Percent	Number	Percent
Class 1	4	0.7	5	0.9
Class 2	297	51.8	233	40.4
Class 3	272	47.5	338	58.7

Table 9

Changes in Dental Fitness Classification from Old to New Criteria (N=585)

	New System		
Old System	1	2	3
1	0	1	1
2	2	0	50
3	0	0	529

Table 10

Teeth Converted to Class 3 Old to New DoD Criteria

(N=65)

Tooth Number	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	4.6	3	4.6
6	1	1.5	4	6.2
8	2	3.1	6	9.2
11	1	1.5	7	10.8
14	4	6.2	11	16.9
15	5	7.7	16	24.6
16	2	3.1	18	27.7
17	10	15.4	28	43.1
22	1	1.5	29	44.6
23	2	3.1	31	47.7
24	4	6.2	35	53.8
25	3	4.6	38	58.5
26	1	1.5	39	60.0
27	2	3.1	41	63.1
29	1	1.5	42	64.6
30	2	3.1	44	67.7
31	3	4.6	47	72.3
32	18	27.7	65	100.0

Table 11

Reasons for Conversion to Class 3
Old to New DoD Criteria
(N=66)

Reasons	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Caries	8	12.1	8	12.1
Temp Restoration	5	7.6	13	19.7
Pericoronitis	15	22.7	28	42.4
Advanced Perio	6	9.1	34	51.5
Progressive Perio	1	1.5	35	53.0
Edentulous Areas	3	4.5	38	57.6
Unerupted Teeth	27	40.9	65	98.5
Pulp Pathology	1	1.5	66	100.0

Table 12

Examiner Agreement Matrix:
Old Criteria

Examiner vs. Standard	Kappa	Standard Error	p
Examiner 1	.752	.1695	.0000046
Examiner 2	.677	.1760	.0000600
Examiner 3	.692	.1866	.0001000
Examiner 4	.564	.1540	.0001300

Table 13

Examiner Agreement Matrix:
New Criteria

Examiner vs. Standard	Kappa	Standard Error	p
Examiner 1	.783	.1137	.0000001
Examiner 2	.419	.1042	.000029
Examiner 3	.364	.1399	.0047
Examiner 4	.783	.1137	.0000001

Table 14

Distribution of Changes in Dental Fitness Class Made by Each Examiner

Examiner	n	Proportion of cases changed					
		None	1->2	1->3	2->3	3->2	2->1
1[a]	192	188	0	1	3	0	0
2	152	148	1	0	3	0	0
3	35	28	0	0	6	0	1
4	29	16	0	0	12	0	1
5	177	151	0	0	26	0	0
Total	585	531	1	1	50	0	2

Note. [a]Standard.